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Original research

Concussion knowledge, attitudes and behaviour in equestrian athletes

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ABSTRACT

Objective: To determine knowledge, attitudes and behaviour towards concussion in adult equestrian athletes.
Design: Nationwide, cross-sectional, questionnaire.
Methods: Participants were recruited via advertisements circulated through social media, community presentations and equestrian organisations. Participants were sent a web link to an online questionnaire previously designed for high school athletes and modified to ensure relevance to equestrian activities. The percentage of correct responses per item and a total knowledge score were calculated. Differences in concussion knowledge by age, sex, level of experience and previous history of concussion were explored using t-tests, 95% confidence intervals (CI) and effect sizes.
Results: The questionnaire was completed by 1486 participants (Mean age = 39.1 ± 15.4). Knowledge of what concussion was, how to recognise it and key symptoms (except poor sleep) was high (>80%). In contrast, awareness of guidelines was moderate (56%) and inability of helmets to prevent concussion was low (12%). Significantly higher levels of knowledge of concussion were identified in females compared with males (t=-6.55 p < 0.001, 95%CI=-3.26 to -1.75). The majority (87%) of participants reported that a helmet should be replaced after a fall, yet 46% reported re-using a helmet following a hit to the head.
Conclusions: Knowledge of and attitudes towards concussion were positive. However, there were knowledge gaps and discrepancies between some attitudes and behaviour on some aspects of concussion. Targeted campaigns to promote awareness of concussion and improve recognition and onward management are needed. Education related to equestrian activities such as helmet use and injury mechanisms is needed to change behaviour and minimise the risk of injury.
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Practical Implications

- Equestrian organisations need to provide clear and consistent messages as to the action to take after a concussion.
- Increased education is needed about lesser known symptoms of concussion and ways to recognise it.
- More information needs to be made publicly available on choosing and using a helmet.
- Training resources and how to fall to reduce injury are needed.

1. Introduction

Concussion is a form of mild traumatic brain injury (TBI).[1] The incidence of TBI is a growing public concern internationally.[2] TBI can lead to persistent cognitive, emotional and physical symptoms that can impact on everyday life for many years, even following an injury classified as being 'mild' in severity.[3–5] Under-reporting, low awareness of concussion, premature return to activity, prior injury and lack of appropriate management can lead to increased symptoms, delayed recovery and risk of re-injury.[1,6–8] The economic costs of providing health care and productivity loss for unresolved concussions are high.[9] Reducing the burden of TBI involves both preventing injuries from occurring and ensuring effective recognition and management.[2] To be effective, health promotion initiatives require accurate data on injury mechanisms, knowledge, awareness and behaviour (in members of the public, athletes, trainers and clinicians) to identify gaps and misunderstandings that can then be addressed with well-designed initiatives.[10]

More than one in five of all TBIs are sustained within a sports or recreation context.[11] Rugby, cycling and equestrian activities have been identified as the sporting activities with the highest risk of TBI.[11] There has been an increase in studies of awareness of concus-

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sion in rugby players (both union and league), which have revealed that lower concussion knowledge and poorer attitudes are related to lower concussion reporting behaviour.[12,13] Important misunderstandings about concussion have been identified, for example, one study revealed that 80% of youth rugby players believed that there needed to be a direct hit to the head to sustain a concussion.[14] Despite the high prevalence of concussion in equestrian sports, little is known about concussion awareness in those engaging in activities involving horses.

A unique aspect of equestrian sports is that a horses' strength, height, speed, and unpredictability all contribute to the velocity of impact and resulting concussion risk.[15] Approximately 70% of equestrian injuries are sustained due to falling from a horse whilst riding.[16] However, a substantial proportion of injuries are sustained when not riding. For example, one study revealed 23% of injuries were due to being knocked over by horse or being kicked in the head. An additional 4% of injuries were due to falling over whilst leading a horse.[11] The wearing of helmets is now a mandatory requirement in competitive sport when riding a horse, however, studies have shown that the majority of equestrian injuries occur during unsupervised leisure riding.[17] Further, as TBIs occur from being around horses as well as riding, it is essential to understand people's awareness of the function of helmets and also helmet use behaviour to help to inform injury prevention messages for this population.[17] Horse-riding helmets are designed to prevent risk of a skull fracture, reduce superficial injury and absorb impact. As damage to a helmet may not always be visible (e.g. damage to the softer internal layer designed to absorb impact) manufacturers recommend replacing a helmet after a fall. However, the extent to which people adhere to these recommendations is unknown.

In order to increase understanding of concussion knowledge and how people use protective equipment such as riding helmets, this study aimed to assess the current state of knowledge, attitudes and behaviour towards concussion in adults involved in a range of equestrian sports across NZ.

2. Methods

A cross-sectional questionnaire was used to assess knowledge, attitudes and behaviour of concussion. Sociodemographic questions about the participant, equestrian activities they engage in, years involved in equestrian activities, level of involvement (e.g. primarily amateur or professional) and personal concussion history were included. Items were then extracted from a questionnaire previously developed to determine concussion awareness in high school rugby players.[12] To ensure relevance of the questionnaire to equestrian activities, the scenario items were amended to present equestrian related examples and additional questions on helmets and their use were added. A list of potential concussion signs was interspersed with symptoms that are potential signs of more severe injury or unrelated illness or injury to determine accuracy of knowledge specific to concussion. The questionnaire was reviewed for content validity by an expert panel, including concussion experts and rehabilitation providers to ensure face validity. Coherence of the items in the questionnaire was checked by two members of the equestrian community. This resulted in the addition of simplified wording added in brackets beside some terms (e.g. trouble sleeping was added in brackets beside the term insomnia). The total concussion knowledge score for this sample was checked for internal consistency using Cronbach's alpha and was found to be acceptable ($\alpha = 0.7$).

Anyone aged over 16 years of age, actively engaged in working with or riding/driving horses and living in New Zealand (NZ) was invited to participate. Equestrian Sports NZ, NZ Pony Cub, Harness Racing NZ, NZ Thoroughbred Racing, Rodeo NZ, NZ Veterinary Association, NZ Farrier Association and study sponsors emailed their members a link to the online questionnaire administered via SurveyMonkey. The link was also advertised in equestrian magazines and through social media e.g. Facebook. Paper copies of the questionnaire were made available prior to two community presentations on concussion for equestrian athletes. The survey was anonymous and those completing the questionnaire were entered into a prize draw for equestrian products kindly donated by the study sponsors to encourage participation. Ethical approval was received from the Auckland University of Technology Ethics Committee (Ref: 18/340).

Responses to the online questionnaire were recorded through SurveyMonkey and exported into SPSS v25.[18] Paper copy questionnaires were then entered manually into the dataset before the dataset was checked and cleaned. Means and standard deviations or frequencies and percentages were calculated dependent of whether parametric assumptions were met. Levels of knowledge were categorised as >80% high, 50-80% moderate and <50% low, as previously used in health knowledge studies.[19] A total knowledge score was calculated using the number of correct responses to the 48 knowledge items in the questionnaire. Differences in concussion knowledge by age, sex, level of involvement and concussion history were explored using t-tests, 95% confidence intervals and Cohen's d effect sizes. P values were considered to be statistically significant at the $p < 0.01$ level.

3. Results

There were 1593 people who responded to the survey invitation, with 26 excluded for not meeting the eligibility criteria or who did not provide consent for further participation. A further 89 cases were excluded as no questionnaire data related to concussion were completed (only demographic questions were answered).

The final sample included data from 1486 participants who met the eligibility criteria and completed the questionnaire. It was not possible to calculate a response rate as the number of participants who saw the advert, but chose not to respond, was unknown. Given there was systematic missing data (e.g., higher levels of missing data on questions such as the number of concussions experienced) likely to reflect participant uncertainty, data were not imputed and all variables were retained in the analysis. Participants ranged in age between 16 and 83 years, with a mean age of 39.1 years (SD 15.4). Further demographic data are outlined in Table 1. Most participants (1,478, 99.5%) completed the survey online and eight (0.5%) in paper format. There were 303 (20.4%) participants identified as a coach/trainer/instructor, 196 (13.2%) did not partake in competitive events, 427 (28.7%) had competed at local level, 251 (26.9%) at a regional level, 441 (29.6%) had competed at national level in equestrian events, and 171 (11.6%) were involved in competitive racing (harness or track racing).

The mean total number of years spent riding/driving/working around horses was 25.6 (14.6), with participants reporting being around horses on average 23.6 (17.5) hours per week. Of the participants who reported experiencing at least one concussion over their lifetime (including both self-reported and medically diagnosed concussions), 301 reported one, 276 reported two, 362 reported three or more and 45 did not know how many they had sustained or had experienced "too many to remember" or "lost count". There was a trend that participants identifying as professionals experienced more concussions than amateurs ($t=-2.22$, $p = 0.06$) but this did not meet statistical significance.

Responses to the concussion knowledge items from the questionnaire are outlined in Table 2. Items are presented in terms of participant responses (with highest percentage of correct responses first) to each section of the questionnaire, rather than

Table 1
Demographics of study participants.

Variable	Frequency	Percentage
Gender	1361	91.6
Female	117	7.9
Male	1	<1
Nonbinary	7	<1
Missing		
Ethnicity	1439	96.8
European	42	2.8
Non-European	5	<1
Missing		
Type of equestrian activities engaged in (tick all that apply)	790	53.2
	766	51.5
Hacking/trekking	583	39.2
Groundwork	543	36.5
Show jumping	408	27.4
Dressage	422	28.4
Eventing	365	24.6
Farm work	344	23.1
Adult riding	134	9.0
Pony club	113	7.6
Thoroughbred racing/track work	108	7.3
Farrier/trimmer	86	5.8
Endurance	79	5.3
Harness racing	53	3.6
Driving	52	3.5
Hunting	42	2.8
Equine healthcare (e.g. osteopathy, nutrition,	29	2.0
nurse, vet, saddle fitter)	114	7.7
Showing		
Western/rodeo Other (e.g. breeding, breaking in/training, judging, riding for the disabled, working equitation, show hunter, rescue, polo, photography, movie work, mounted games, parents or grooms)		
Personal concussion history	984	66.2
One or more	366	24.6
None	100	6.7
Don't know	36	4.0
Missing		
Primary reason for engaging in equestrian	1119	75.3
activities	367	24.7
Recreational		
Professional		
Have you ever received information about	1038	69.9
concussion from any of the following? (tick as	1006	67.7
many as apply)	914	61.5
Doctor/physiotherapists or other health	764	51.4
professional	638	42.9
Friends or family	593	39.9
TV or social media	531	35.7
Other riders	313	21.0
National accident compensation provider	82	5.5
(ACC)		
Equestrian Organisation (e.g. pony club, or equestrian		
sports NZ)		
School/work/university		
Trainer/coach/instructor		
Other (e.g. first aid courses, health professional, through other sports, horse related magazines, personal experience		

by questionnaire order. Total concussion knowledge scores ranged between 19 and 47 (possible range 0–48) with a mean score of 38.4 (SD 4.01). Whilst there were high levels of awareness of concussion symptoms (except insomnia) and recognition of clinical scenarios, there did appear some confusion between symptoms of concussion and those more indicative of a severe brain or spinal cord injury (e.g. 41% incorrectly indicated that a sharp burning pain in neck was a sign or symptom of concussion). Less than half of participants (43.8%) were aware of any concussion guidelines and there was considerable diversity in responses to how long a person should wait before riding/driving or working with horses following a concussion. Knowledge of the functioning of a helmet was low, with only 13% of participants correctly identifying that a helmet does not prevent concussion. Eighty percent of participants correctly stated that a concussion was an injury to the brain.

There were no statistically significant sub-group differences in concussion knowledge levels by age ($t = 1.08$, $p = 0.279$, 95%CI=-1.87 to 0.65, $d = 0.05$) or being competitive or not ($t = 2.57$, $p = 0.010$, 95%CI = 0.19–1.41, $d = 0.19$). The p values did indicate differences in concussion knowledge levels by prior history of concussion (t=-5.19, p=<0.001, 95%CI=-1.76 to 0.79, $d = 0.31$) and level of involvement ($t = 2.87$, $p = 0.004$, 95%CI=-1.18 to 0.22, $d = 0.19$), however both confidence intervals crossed one and therefore cannot be considered as statistically significant (see Supplementary Figure). Significantly higher levels of knowledge of concussion were identified in females with a medium effect size (t=-6.55 $p < 0.001$, 95% CI= -3.26 to -1.75, $d = 0.56$).

There was strong agreement of the need to see a medical professional following a concussion (Table 3). Most participants (1369, 92%) indicated that a doctor should be the responsible person to make the decision about when a person is ready to return to riding. An additional 38 (2.6%) believed that it should be a decision between the doctor and the person themselves. There were 64 (4.3%) who felt it should be the affected person's decision only and 15 (1%) who felt it should be the decision of the coach, family or friends. Many participants reported concerns that they did not feel confident that their GPs or emergency clinicians knew enough about concussion to make the best decision. There was a discrepancy between some attitudes and behaviour outlined in Table 3. For example, there was strong positive agreement that a helmet should be replaced after a fall, yet nearly half of participants reported having re-used a helmet following a hit to the head. Further, there was a disconnect between knowledge of return to riding/driving guidelines and likely behaviour, with one in ten (N = 153, 10.3%) of participants stating that they would return to riding sooner than they believed was recommended.

Whilst the majority wore a helmet when riding, up to one in ten choose not to. Rates of helmet use when driving, leading, lunging, picking out horse's feet were very low to moderate. Only a third of participants (N = 527, 35.5%) had been taught how to fall to reduce the risk of injury.

4. Discussion

This study aimed to determine knowledge, attitudes and behaviour towards concussion within adults engaged in equestrian activities. Knowledge of concussion symptoms was high, but this knowledge did not necessarily appear to translate to behaviour. There was low level knowledge of the function of helmets, potential implications of concussion, awareness of concussion guidelines and how to respond following a concussion. Some riders continue to ride without a helmet and only a third had been taught how to fall to reduce injury. Most information on concussion was received following previous injury from health professionals. These identified knowledge gaps and poor behaviours highlight areas where public health initiatives could be targeted to improve concussion awareness, minimise the risk of brain injury and ensure people know what to do if they experience a concussion.

The prevalence of concussion was higher than reported in a previous study of equestrian athletes attending a competitive venue (44%).[6] Differences in prevalence between the two studies may reflect an increased awareness of concussion over the last five years and therefore greater reporting.[6] The findings may also reflect differences between the two samples and study methodologies, with the current study using an anonymous online survey and the comparative study surveying a smaller number people, in person,

Table 2
Knowledge of concussion.

Knowledge Items	Frequency	Percentage Correct
Have you heard of the term concussion?	1467	88.7
Have you heard of any guidelines about concussion?	835	56.2
Complete the sentence. Concussion is an injury to the. . .	1189	80.0
(correct answer = brain)		
Please indicate which of the following you would consider to be a sign or symptom of concussion (please check all	1465	98.6
that apply)	1449	97.5
Skin rash - false	1427	96.0
Confusion - true	1418	95.4
Headache - true	1415	95.2
Amnesia (not remembering what happened before or after the accident) - true	1407	94.7
Loss of consciousness (being knocked out) - true	1382	93.0
Blurred vision - true	1362	91.7
Dizziness – true	1353	91.0
Joint stiffness – false	1339	90.1
Fever - false	1171	78.8
Nausea (feeling sick/the need to vomit) – true	1141	76.8
Black eye - false	971	65.3
Weakness in neck movements – false	695	46.8
Sharp burning pain in neck - false		
Insomnia (trouble sleeping) - true		
Which of the following people would you say might be concussed?	1428	96.0
A couple of hours after a fall the person complains of feeling sick with a headache (hasn't been drinking alcohol)	1425	95.9
After a fall the person complains of headaches and has blurred vision	1411	95.0
After a fall the person complains of stinging or burning in the calf muscles	1395	93.9
After a fall, the person starts to make mistakes and seems confused	1201	80.8
After a fall the person is left on the ground not moving		
A concussion only occurs if you lose consciousness - false	1453	97.8
Symptoms of concussion can occur several hours or days later - true	1469	98.9
You need to directly hit your head to experience a concussion? - false	1126	75.8
If a person gets concussed how long should they wait before returning to riding/driving or working with horses?	898	60.4
(correct answer - when symptoms have resolved or 3 weeks)		
Of the following what are the possible complications of experiencing multiple (more than one) concussions? (tick all	1430	96.2
that apply)	1364	91.8
Joint problems - false	1239	83.4
Increased symptoms or delayed recovery - true	1074	72.3
Increased risk of further injury - true		
Paralysis - false		
Of the following, what are the possible complications of returning to riding/driving or working with horses too soon?	1432	96.4
Joint problems – false	1355	91.2
Increased risk of further injury - true	1240	83.4
Increased symptoms or delayed recovery - true	1018	68.5
Reduced sports performance - true		
If someone has suffered a concussion who is the best person to decide if they should ride/drive/work with horses	1369	92.1
again?		
Doctor		
Which of the following activities should be avoided following a concussion? (tick all that apply)	1374	92.5
Riding/driving or handling horses	1218	82.0
Jogging/running	1192	80.2
Gym training	927	62.4
Going for a long walk	880	59.2
Going to sleep	865	58.2
Using a computer	787	53.0
Watching TV	738	49.7
Texting or using a mobile phone	694	46.7
School/work		
What does wearing a helmet do?	1398	94.1
Reduces risk of skull fracture - true	1322	89.0
Absorbs impact from a fall - true	601	40.4
Reduces risk of cuts, bruises and grazes - true	189	12.7
Reduces risk of concussion - false		

at competitive events. Previous reviews on the epidemiology of sports concussion in contact sports, such as rugby and football, have shown that the prevalence of concussion varies by type and level of sport, forces exposed to (e.g. differences in position played in team sports) and by hours engaged in the sport.[20,21] In contrast, there were no differences found between competitive/non-competitive, level of involvement or by age within the present study. In contact sports, the high impact nature means that there is much likely to be a linear relationship between greater player hours and increased concussion prevalence. In equestrian sports, concussions are more likely to occur on an 'ad hoc' basis. Indeed, one study revealed that equestrian concussions tend to be less prevalent than in contact sports such as rugby, but may be more severe.[22]

It is important to note that whilst indicating a higher prevalence, these findings are likely to be an underestimate as many participants were unable to state the exact number of concussions they had experienced due to them being too numerous or a long time ago. Additionally, some participants noted that they only reported equestrian related concussions rather than all lifetime concussions or only medically diagnosed concussions. Clarity is therefore needed when asking about previous lifetime concussion history to assist with accurate reporting in future research.

Table 3
Attitudes and Behaviour.

Attitude Items. To what extent do you agree with the following statements?	Frequency	Percentage
It is important to report a possible concussion to a medical professional.	915	61.6
Strongly agree	468	31.5
Agree	79	5.3
Not sure	20	1.3
Disagree	3	<1
Strongly disagree	1	<1
Missing		
You should not use a helmet again after a fall where there was a hit to the head and a new one should be purchased?	843	56.7
Strongly agree	451	30.3
Agree	95	6.4
Not sure	45	3.0
Disagree	14	<1
Strongly disagree	38	2.6
Missing		
Behaviour Items		
Do you usually wear a helmet during the following activities?	1267	95.3
Competing	1329	89.4
Hacking	1306	87.9
Schooling	318	53.9
Driving horses	361	24.3
Groundwork	291	19.6
Lunging	181	12.2
Tacking up	93	6.3
Picking out or working around horse's feet	76	5.1
Leading a horse	42	2.8
Teaching /coaching		
Have you ever continued to use the same helmet after a hit to the head?	688	46.3
How long would you wait before riding/driving or working with horses after a concussion?	743	50.0
When the symptoms have resolved (gone away)	180	12.1
Straight away	157	10.6
1 week	103	6.9
2 weeks	105	7.1
3 weeks	93	6.3
4 weeks	105	7.1
Don't know/Missing		

Whilst there was high awareness of the common signs and symptoms of concussion to support recognition of concussion, there was also a high false positive rate on distractor symptoms (such as pain in the neck and neck weakness). This finding suggests low specificity of knowledge about the symptoms of concussion and how they may differentiate from broader head injuries, more severe TBI, spinal cord injury and indicators that may make someone check for concussion but are not direct symptom e.g. black eye. Similar findings regarding uncertainty of concussion symptoms when compared to other psychological and neurological diagnoses has previously been noted.[23,24] A few participants also commented that the term 'concussion' can also refer to an injury in horses legs. Careful use and clarification around terminology of 'concussion' is needed in the equestrian population.

Knowledge of concussion is important as early recognition and management may facilitate improved outcomes and a shorter recovery time.[23] Many concussions occur without a healthcare professional present which makes equestrian athletes, parents, coaches and stewards an important part of ensuring appropriate care.[23] Level of involvement (amateur versus professional) did not appear to impact on knowledge of concussion as found in previous research with jockeys.[24] The most common modes of receiving information on concussion were from health professionals, friends/family and the media. These findings highlight the important role of the media and sports professionals as role models in communicating key messages about concussion to the general public. Representation of concussion has been found to vary considerably in the media and consistent messaging may help to increase concussion awareness in the general population.[25] Equestrian organisations may also need to adopt a more proactive approach to concussion increasing awareness of concussion within their sport to help minimise the risk of the injury occurring and optimal responses following injury.

Awareness of concussion guidelines was found to be lower in this study (56%) than in a previous study of equestrian athletes in the US (65%).[6] However, there were difficulties in comparing the two study findings given the US study comprised a much smaller sample that was less representative of all equestrian activities. Indeed, there was considerable diversity in responses to the question regarding when a person should return to riding following a concussion. Differences between the study findings may also reflect that the NZ equestrian guidelines were only released six months prior to the study. Alternatively, differences may also reflect a lack of knowledge due to inconsistent messages from different sporting organisations. Some organisations such as Equestrian Sports NZ state return to sport after 24 h, following medical clearance and resolution of symptoms,[26] in contrast to other organisations such as NZ Rugby specify a mandatory stand-down timeframe i.e. three weeks).[27] Given the inconsistent and concerning responses of participants regarding how soon they would return to riding after a concussive incident, it appears that an educational document outlining clear guidance for return to riding procedures would be beneficial.

One of the key areas where there was a gap in knowledge was in relation to the function of riding helmets. A high proportion (87.3%) incorrectly believed that wearing a helmet would prevent concussion. This findings was similar to results in previous research in rugby union[28] indicating a lack of understanding of helmet design and what happens to the brain following an impact. Additionally, only 40% correctly identified that helmets are designed to reduce risk of cuts/bruises and lacerations to the head. In contrast there was high awareness that a riding helmet reduces the risk of skull fracture and absorbs impact from a fall. Whilst most participants

reported wearing a helmet, a small proportion chose not to. Use of helmets when not riding e.g. when lunging, doing groundwork or picking out hooves was low (6-24%). Research has shown that 27% of equestrian injuries occur whilst conducting these unmounted activities,[11] suggesting that this could be a key area to target for injury prevention. Encouraging people to wear a helmet when grooming and tacking up horses, not just when riding, may help protect against these other events leading to brain injuries.[11,29]

Only a third of study participants had received training in how to fall from a horse to reduce injury. Whilst falling often happens quickly and without warning, there are techniques that can help to minimise injury such as trying to release feet from the stirrups, tucking in arms and rolling away from the horse to prevent being kicked or landed on by the horse and to reduce fracture to wrist and hands.[29] This could be added into training programmes to help reduce both concussion and other external injuries.

A strength of the study was that there was representation from a wide diversity of equestrian activities including those breaking in and working with young horses, jockeys, western and rodeo riders as well as pleasure riders and those who don't ride or drive horses themselves but are still involved in working closely with horses and at risk of concussion (e.g. parents, breeders, coaches and in-hand showing). However, the generalisability of the findings may be affected by the low proportion of males (7.9%) who completed the questionnaire. In the Active NZ Survey series 2013/14 report,[30] 73% of those who had participated in an equestrian sport within the last 12 months were female. Other epidemiological studies have identified that a higher proportion of females were injured in equestrian activities with 70% of those attending emergency clinics with an equestrian activities identifying as female.[31] This is comparable with evidence from other sports showing higher rates of concussion in females.[21] However, the 70% was lower than our male to female ratio in this study suggesting that males may have been less likely to take part in the survey. A further limitation was that participant's concussion histories were based on self-report. The proportion of these injuries that were medically verified was unable to be determined due to the anonymity of the survey. The frequency and factors influencing medical attendance following suspected concussion would be a useful area for further research. Further, the range of concussion symptoms included in the questionnaire was limited and consequently the study was unable to determine knowledge of less well-known symptoms of concussion such as tonic posturing, vacant look, balance difficulties and seizure that can be helpful in recognising concussion. The study did not take levels of education into account. We were unable to estimate the questionnaire response rate due to a high proportion of non-registered equestrians in New Zealand and a wide diversity of equestrian organisations.

5. Conclusion

Knowledge and behaviour gaps towards concussion are still evident in equestrian athletes. A proactive and coordinated approach is needed between equestrian organisations to give consistent clear messages about return to riding and working with horses. The study has highlighted that concussion knowledge translation into behaviour is poor, the function of helmets is misunderstood, clear and consistent information for return to activity across different sport guidelines is needed.

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Conflict of interest

The authors have no conflicts of interest to declare.

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